Geology, structure, and source of the Kikkertavak Anorthosite, northern Labrador, Canada

Donald Wright
Department of Earth Sciences
Memorial University of Newfoundland
Canada

The origin and petrogenesis of anorthosites are poorly known. Several issues dominate the “Anorthosite Problem”. These include issues related to the source and fractionation of magmas, the emplacement and crystallization of these magmas, and the overall tectonic regime in which these processes take place. Current research of the Labrador Research Group of the Department of Earth Sciences, Memorial University of Newfoundland is addressing these issues through a study of the regional geology of the Nain Plutonic Suite of Labrador.

The Nain Plutonic Suite is considered the type example of a Proterozoic Anorthosite-Mangerite-Charnokite-Granite (AMCG) suite. Proterozoic AMCG suites occur worldwide; they have generally been interpreted as anorogenic magmatic products, and attributed to a variety of processes, especially plumes. Current work in the NPS has revealed that pluton emplacement was associated with shear zones and dyke swarms. These features indicate that the plutons were intruded into an extensional/transpressional environment and do not reflect diapirism above a mantle plume.

As a contribution to this research project I have mapped most of a large (20 x 60 km.) pluton of anorthosite called the Kikkertavak Anorthosite. This body is one of the youngest components of the c. 1360-1300 Ma Nain Plutonic Suite. Most of the older anorthosite plutons are partly deformed and recrystallized, whereas the Kikkertavak Anorthosite contains largely pristine mineralogy and structures. The pluton is a rectangular, tabular body and was intruded into Archean quartzo-feldspathic gneisses and deformed and recrystallized Proterozoic anorthosites and related rocks. The Kikkertavak Anorthosite has in turn been intruded by monzonitic and granitic sheets, and has been dissected by north-south and east-west trending mafic dykes and shear zones.

The feldspar crystals that comprise most of the Kikkertavak Anorthosite come in a range of sizes and textures that can be directly correlated with the crystallization history of this pluton. The pluton also contains relatively small amounts of olivine, orthopyroxene, and magnetite/ilmenite. Contact products with host rocks include heterogeneously layered troctolites, norites and anorthosites along the walls of the pluton and more massive troctolites and norites in the roof.

Several textural and mineral facies are observed within the Kikkertavak Anorthosite, and the relationships within and between these facies preserve a physical record of the history of this pluton. The cumulate texture, mineralogy, and differences in texture between components of the Kikkertavak Anorthosite suggest that it is the product of more than one melt and has had a protracted history of crystallization and fractionation. A detailed study of individual feldspar crystals is underway that will place further constraints on the source and crystallization history of these rocks. The feldspar crystals from the different phases of the Kikkertavak Anorthosite have the potential to preserve trace element and isotopic signatures spanning the crystallization history and prehistory of the pluton. The evolution of these values within individual feldspar crystals will provide key information on the source, fractionation, and possible contamination involved in the production of anorthositic magmas.